

AMENDMENT OF THE CLAIMS TO INVENTION:

668 *669 681*
Please cancel Claims 1-~~669~~ and add new Claims ~~670~~-~~682~~ as follows:

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R1.26
-~~670~~. An automatic vehicle classification and identification (AVIC) system for installation along a roadway, comprising:

a first planar light illumination and imaging (PLIIM) based imaging and profiling subsystem mounted above said roadway, and arranged for (1) profiling the geometry of top surface of each vehicle travelling under said PLIIM-based profiling and imaging subsystem and generating vehicle profile data, for each vehicle profiled by said PLIIM-based imaging and profiling subsystem, and also for (2) capturing digital images of both the front and rear license plates mounted on each said vehicle travelling under said PLIIM-based profiling and imaging subsystem, and generating vehicle image data representative of each captured digital image;

a second planar light illumination and imaging (PLIIM) based imaging and profiling subsystem mounted above said roadway, and arranged for (1) profiling the geometry of side surface of each vehicle travelling under said PLIIM-based imaging and profiling subsystem and generating vehicle profile data, for each vehicle profiled by said PLIIM-based imaging and profiling subsystem, and also (2) capturing digital images of both the front and rear license plates mounted on each said vehicle travelling under said PLIIM-based profiling and imaging subsystem, and generating vehicle image data representative of each captured image; and

a computer system for receiving vehicle image and profile data generated by said first and second PLIIM based profiling systems, and processing said vehicle image and profile data so as to automatically identify and classify each vehicle travelling along said roadway.--

670 *669*
-~~671~~. The AVIC system of claim ~~670~~, wherein each said PLIIM-based imaging and profiling subsystem comprises:

a system housing;

a linear imaging subsystem, mounted within said system housing, for producing a series of linear 2-D images of said moving vehicle surface as said vehicle surface moves past said object profiling subsystem; and

an object profiling subsystem, mounted within said system housing, for profiling the surface of said vehicle as said vehicle moves past said system, and producing a series of linear 3-D surface profile maps of said moving vehicle surface as said vehicle surface moves past said object profiling subsystem, wherein each said linear 3-D surface profile map comprises a set of 3-D coordinates specifying the location of sampled points along said moving vehicle surface.--

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-*672*. The AVIC system of claim *671*, wherein said system housing has first, second and third light transmission apertures linearly aligned with and optically isolated from each other, and said third light transmission aperture being disposed between said first and second light transmission apertures.--

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-*673*. The AVIC system of claim *672*, wherein said linear imaging subsystem comprises:
a linear image formation and detection module disposed in system housing, and having image formation optics with a field of view projectable through said third light transmission aperture and onto said vehicle moving relative to said first, second and third light transmission apertures during vehicle illumination and imaging operations; and

a pair of planar laser illumination arrays (PLIAs) disposed on said system housing, each said planar laser array (PLIA) including a plurality of laser diodes arranged together in a linear manner and said planar laser illumination arrays being arranged in relation to said linear image formation and detection module, and for producing a pair of planar laser illumination beams (PLIBs), and projecting said pair of planar laser illumination beams through said first and second light transmission apertures and oriented such that the plane of said planar laser illumination beams is coplanar with the field of view of said linear image formation and detection module so that the vehicle can be simultaneously illuminated by said planar laser illumination beams and imaged within said field of view of said linear image formation and detection module,

whereby a series of linear images of said vehicle are sequentially detected by said linear image formation and detection module as said vehicle moves past first, second and third light transmission apertures, so that said series of linear images can be grabbed and buffered for subsequent use in constructing two-dimensional images of said vehicle.--

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-*674*. The AVIC system of claim *673*, which further comprises:
an image frame grabber for grabbing images formed and detected by said image formation and detection module,
an image data buffer for buffering said grabbed images;
an image processing computer operably associated with said image data buffer, for processing said buffered images; and
a camera control computer for controlling said linear image formation and said detection module, and said pair of planar laser illumination arrays.--

674 *672*
-*675*. The AVIC system of claim *673*, wherein said image forming optics have a variable focal distance and a variable focal length providing a variable field of view.--

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--676. The AVIC system of claim 672, wherein said object profiling subsystem comprises a mechanism for producing and projecting a laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.--

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--677. The AVIC system of claim 672, wherein said object profiling subsystem comprises a mechanism for producing and projecting an amplitude modulated (AM) laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.--

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--678. The AVIC system of claim 672, wherein said linear imaging subsystem comprises:
a linear image formation and detection module disposed in system housing, and having image formation optics with a field of view projectable through said third light transmission aperture and onto said vehicle moving relative to said first, second and third light transmission apertures during vehicle illumination and imaging operations; and

a pair of planar light illumination arrays (PLIAs) disposed on said system housing, each said planar light illumination array (PLIA) including a plurality of light emitting diodes (LEDs) arranged together in a linear manner and said planar light illumination arrays being arranged in relation to said linear image formation and detection module, and for producing a pair of planar light illumination beams (PLIBs), and projecting said pair of planar light illumination beams through said first and second light transmission apertures and oriented such that the plane of said planar light illumination beams is coplanar with the field of view of said linear image formation and detection module so that the vehicle can be simultaneously illuminated by said planar light illumination beams and imaged within said field of view of said linear image formation and detection module,

whereby a series of linear images of said vehicle are sequentially detected by said linear image formation and detection module as said vehicle moves past first, second and third light transmission apertures, so that said series of linear images can be grabbed and buffered for subsequent use in constructing two-dimensional images of said vehicle.--

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--679. The AVIC system of claim 678, which further comprises:

an image frame grabber for grabbing images formed and detected by said image formation and detection module,

an image data buffer for buffering said grabbed images;

an image processing computer operably associated with said image data buffer, for processing said buffered images; and

a camera control computer for controlling said linear image formation and said detection module, and said pair of planar laser illumination arrays.--

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--680. The AVIC system of claim 678, wherein said image forming optics have a variable focal distance and a variable focal length providing a variable field of view.--

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--681. The AVIC system of claim 678, wherein said object profiling subsystem comprises a mechanism for producing and projecting a laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.--

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--682. The AVIC system of claim 678, wherein said object profiling subsystem comprises a mechanism for producing and projecting an amplitude modulated (AM) laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.--

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REQUIREMENT UNDER 37 C.F.R. 1.121

As required under 37 C.F.R. 1.121, a clean version of the first paragraph of Page 1 is as follows:

This is a Continuation of copending Application No. 09/990,585 filed November 21, 2001 which is a Continuation-in-Part of: copending Application Serial No. 09/999,687 filed October 31, 2001; copending Application Serial No. 09/954,477 filed September 17, 2001; copending Application Serial No. 09/883,130 filed June 15, 2001, which is a Continuation-in-Part of Application Serial No. 09/781,665 filed February 12, 2001; copending Application Serial No. 09/780,027 filed February 9, 2001; copending Application Serial No. 09/721,885 filed November 24, 2000; Application Serial No. 09/327,756 filed June 7, 1999; and International Application Serial No. PCT/US00/15624 filed June 7, 2000, published as WIPO WO 00/75856 A1; each said application being commonly owned by Assignee, Metrologic Instruments, Inc., of Blackwood, New Jersey, and incorporated herein by reference as if fully set forth herein in its entirety.

Also required under 37 C.F.R. 1.121, a clean set of the amended Claims is provided herebelow:

670. An automatic vehicle classification and identification (AVIC) system for installation along a roadway, comprising:

a first planar light illumination and imaging (PLIIM) based imaging and profiling subsystem mounted above said roadway, and arranged for (1) profiling the geometry of top surface of each vehicle travelling under said PLIIM-based profiling and imaging subsystem and generating vehicle profile data, for each vehicle profiled by said PLIIM-based imaging and profiling subsystem, and also for (2) capturing digital images of both the front and rear license plates mounted on each said vehicle travelling under said PLIIM-based profiling and imaging subsystem, and generating vehicle image data representative of each captured digital image;

a second planar light illumination and imaging (PLIIM) based imaging and profiling subsystem mounted above said roadway, and arranged for (1) profiling the geometry of side surface of each vehicle travelling under said PLIIM-based imaging and profiling subsystem and generating vehicle profile data, for each vehicle profiled by said PLIIM-based imaging and profiling subsystem, and also (2) capturing digital images of both the front and rear license plates mounted on each said vehicle travelling under said PLIIM-based profiling and imaging subsystem, and generating vehicle image data representative of each captured image; and

a computer system for receiving vehicle image and profile data generated by said first and second PLIIM based profiling systems, and processing said vehicle image and profile data so as to automatically identify and classify each vehicle travelling along said roadway.

671. The AVIC system of claim 670, wherein each said PLIIM-based imaging and profiling subsystem comprises:

a system housing;

a linear imaging subsystem, mounted within said system housing, for producing a series of linear 2-D images of said moving vehicle surface as said vehicle surface moves past said object profiling subsystem; and

an object profiling subsystem, mounted within said system housing, for profiling the surface of said vehicle as said vehicle moves past said system, and producing a series of linear 3-D surface profile maps of said moving vehicle surface as said vehicle surface moves past said object profiling subsystem, wherein each said linear 3-D surface profile map comprises a set of 3-D coordinates specifying the location of sampled points along said moving vehicle surface.

672. The AVIC system of claim 671, wherein said system housing has first, second and third light transmission apertures linearly aligned with and optically isolated from each other, and said third light transmission aperture being disposed between said first and second light transmission apertures.

673. The AVIC system of claim 672, wherein said linear imaging subsystem comprises:
a linear image formation and detection module disposed in system housing, and having image formation optics with a field of view projectable through said third light transmission aperture and onto said vehicle moving relative to said first, second and third light transmission apertures during vehicle illumination and imaging operations; and

a pair of planar laser illumination arrays (PLIAs) disposed on said system housing, each said planar laser array (PLIA) including a plurality of laser diodes arranged together in a linear manner and said planar laser illumination arrays being arranged in relation to said linear image formation and detection module, and for producing a pair of planar laser illumination beams (PLIBs), and projecting said pair of planar laser illumination beams through said first and second light transmission apertures and oriented such that the plane of said planar laser illumination beams is coplanar with the field of view of said linear image formation and detection module so that the vehicle can be simultaneously illuminated by said planar laser illumination beams and imaged within said field of view of said linear image formation and detection module,

whereby a series of linear images of said vehicle are sequentially detected by said linear image formation and detection module as said vehicle moves past first, second and third light transmission apertures, so that said series of linear images can be grabbed and buffered for subsequent use in constructing two-dimensional images of said vehicle.

674. The AVIC system of claim 673, which further comprises:

an image frame grabber for grabbing images formed and detected by said image formation and detection module;

an image data buffer for buffering said grabbed images;

an image processing computer operably associated with said image data buffer, for processing said buffered images; and

a camera control computer for controlling said linear image formation and said detection module, and said pair of planar laser illumination arrays.

675. The AVIC system of claim 673, wherein said image forming optics have a variable focal distance and a variable focal length providing a variable field of view.

676. The AVIC system of claim 672, wherein said object profiling subsystem comprises a mechanism for producing and projecting a laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.

677. The AVIC system of claim 672, wherein said object profiling subsystem comprises a mechanism for producing and projecting an amplitude modulated (AM) laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.

678. The AVIC system of claim 672, wherein said linear imaging subsystem comprises:

a linear image formation and detection module disposed in system housing, and having image formation optics with a field of view projectable through said third light transmission aperture and onto said vehicle moving relative to said first, second and third light transmission apertures during vehicle illumination and imaging operations; and

a pair of planar light illumination arrays (PLIAs) disposed on said system housing, each said planar light illumination array (PLIA) including a plurality of light emitting diodes (LEDs) arranged together in a linear manner and said planar light illumination arrays being arranged in relation to said linear image formation and detection module, and for producing a pair of planar light illumination beams (PLIBs), and projecting said pair of planar light illumination beams through said first and second light transmission apertures and oriented such that the plane of said planar light illumination beams is coplanar with the field of view of said linear image formation and detection module so that the vehicle can be simultaneously illuminated by said planar light illumination beams and imaged within said field of view of said linear image formation and detection module,

whereby a series of linear images of said vehicle are sequentially detected by said linear image formation and detection module as said vehicle moves past first, second and third light transmission apertures, so that said series of linear images can be grabbed and buffered for subsequent use in constructing two-dimensional images of said vehicle.

679. The AVIC system of claim 678, which further comprises:

- an image frame grabber for grabbing images formed and detected by said image formation and detection module;
- an image data buffer for buffering said grabbed images;
- an image processing computer operably associated with said image data buffer, for processing said buffered images; and
- a camera control computer for controlling said linear image formation and said detection module, and said pair of planar laser illumination arrays.

680. The AVIC system of claim 678, wherein said image forming optics have a variable focal distance and a variable focal length providing a variable field of view.
681. The AVIC system of claim 678, wherein said object profiling subsystem comprises a mechanism for producing and projecting a laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.
682. The AVIC system of claim 678, wherein said object profiling subsystem comprises a mechanism for producing and projecting an amplitude modulated (AM) laser beam across the surface of each said vehicle as said vehicle is moving past said object profiling subsystem.